Appendix G

Engineering Design File for the PBF-16 Sampling and Analysis Results

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Engineering Design File

Results of FY 2000 Soil Sampling at the SPERT-II Leach Pond, CERCLA Site PBF-16, OU 5-12

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3. Subtask OU 5-12 RD/RA Phase II Work Plan

4. Title: Results of FY 2000 Soil Sampling at the SPERT-II Leach Pond, CERCLA Site PBF-16, OU 5-12

5. Summary: Surface and subsurface soil samples were collected at the SPERT-II leach pond to determine the extent of mercury contamination for the purposes of designing the soil removal action. A statistical based sampling design was implemented, with a total of 29 surface samples, and 20 subsurface samples being collected and analyzed for mercury. Three samples contained mercury above the method detection limit, but below the 0.5 mg/kg remedial action goal. Based on field screening measurements and laboratory analytical results for mercury, additional analyses were requested on four surface and four subsurface samples for CLP metals and TCLP metals. The additional analyses showed other metal concentrations to be consistent with INEEL background values, and below the RCRA regulatory limits for the toxicity characteristic. As a result, no remedial action will be implemented at the PBF-16 CERCLA site.

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Distribution (summary package only):

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	contract labor program
DOE-ID	U. S. Department of Energy Idaho Operations Office
INEEL	Idaho National Engineering and Environmental Laboratory
OU	Operable Unit
PBF	Power Burst Facility
RCRA	Resource Conservation Recovery Act
SPERT-II	Special Power Excursion Reactor Test No. 2
TCLP	toxicity characteristic leaching procedure
TRA	Test Reactor Area
VSP	Visual Sample Plan

Results of FY 2000 Soil Sampling at the SPERT-II Leach Pond, CERCLA Site PBF-16, OU 5-12

1. INTRODUCTION

The Special Power Excursion Reactor Test No. 2 (SPERT-II) reactor was a low-pressure, heavy water nuclear reactor that operated for five years from 1959 to 1964. The Power Burst Facility (PBF) SPERT-II Leach Pond (PBF-16) is located approximately 300 ft. south of the SPERT-II reactor building (PBF-612). It has maximum dimensions of 167 × 230 ft., and is surrounded by a six-sided, mesh and barbed wire fence, with a 10 ft. gate located on the east side. Figure 1-1, is a view of the pond area looking north towards the SPERT-II reactor building. Directly beneath the fence, along the west and south sides, is a compacted gravel base course. A berm extends along the northwest side of the pond area, outside of the fence. A 4-in. vitrified clay drainpipe originating at the reactor building and terminating at the leach pond was used to convey waste effluent to the leach pond. The outlet for the clay drainpipe rests on a concrete and rock apron in the northwest corner of the pond basin.

1.1 Source, Nature and Extent of Contamination

The PBF-16 leach pond was used for disposal of de-mineralizer effluent, water softener waste, emergency shower drain water, and discharges from the floor drains from the SPERT-II reactor building from 1959 to 1964. Discharge to the pond has also included clean water from the PBF maintenance shop air compressor condensate line (Hillman-Mason et al. 1994).

Characterization activities were conducted in 1982 to complete decontamination and decommissioning of the deactivated SPERT-II facility. The pond area was surveyed with handheld radiation detection instrumentation; additionally, vertical profile sampling and surface soil and mud samples were collected and analyzed for and sampled for radiological contamination. Figure 2-4 shows the locations of surface, mud and trench (vertical profile) samples. This figure also shows the approximate extent of water coverage in the pond at the time of the sampling. Two water samples were collected from the pond, and clippings from the new growth of various plants and trees in the pond area were taken. In addition, smears were taken from the gate, pipe outlet, concrete apron, and from eight of the floor drains inside the reactor building. All samples and smears were sent to the Test Reactor Area (TRA) Radiation Measurements Laboratory and analyzed for gamma-emitting radionuclides. Additionally two of the soil samples were sent to the Exxon Nuclear Idaho Company laboratory where they were analyzed for gross alpha, gross beta, Sr-90, U-234, U-235, U-238, Pu-238 and Pu-239/240 (Crews 1982).

The radiological survey and soil sample analytical results did not show any detectable activity distinguishable above the reported Idaho National Engineering and Environmental (INEEL) background values. The analytical results from the water, mud and vegetation samples were either below the instrument detection limits, or below the INEEL background values. Additionally, no detectable activity was measured on any of the smears (Crews 1982).

An analysis of the PBF-16 leach pond non-radiological contaminants was conducted in October 1983. The contaminants analyzed for were based on past facility operations and included arsenic, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, and toxaphene. The analysis results indicated that the leach pond did not contain total contaminant concentrations in excess of the Extraction Procedure Toxicity Limits as defined under the Resource Conservation Recovery Act (RCRA); however, lead and mercury were detected in concentrations exceeding background values with maximum concentrations of 32 mg/kg for lead and 0.71 mg/kg for mercury (Hillman-Mason et al. 1994).

Figure 1-1. PBF-16 (SPERT-II) leach pond and fence with SPERT-II reactor building in background.

2. OBJECTIVES

The objectives of this field sampling event included:

- Determine whether or not average mercury contamination is present in the PBF-16 leach pond area at levels of 0.5 mg/kg or greater
- Define the extent of mercury contamination exceeding the 0.5 mg/kg remedial action goal
- Determine whether or not the PBF-16 soils with total mercury contamination exceeding 4 mg/kg meet the mercury toxicity characteristic leaching procedure (TCLP) limit of 0.2 mg/L.

The project was conducted in accordance with the requirements set forth in the Final Record of Decision for Power Burst Facility and Auxiliary Reactor Area (DOE-ID 2000), and the Field Sampling Plan for the PBF-16 (SPERT-II) Leach Pond (INEEL 2000). Refinement of the extent of contamination is necessary to minimize the volume of soil that will be excavated and disposed of during the operable unit (OU) 5-12 Phase II remedial action.

3. METHODS AND MATERIALS

Samples were collected at the PBF-16 SPERT-II leach pond in support of the OU 5-12 remedial design/remedial action. A stratified, statistical sampling approach was used to evaluate the aerial and vertical extent of mercury concentrations in the surface and subsurface soils inside the pond area. Additional analyses, including total metals and TCLP metals, to evaluate the levels and RCRA toxicity characteristic for metals other than mercury at biased locations in the pond. These additional analyses were performed to provide data to support the decision not to perform any remedial action at the PBF-16 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site.

3.1 Sampling Design

Initially, the history and physical layout of the site was considered to evaluate potential spatial heterogeneities. Based on observations, topographical maps and information from the *SPERT-II Leach Pond Characterization* (Crews 1982), the PBF-16 pond area was divided into two strata; specifically, 1) Stratum 1—the area of the pond that actually received effluent discharge from the SPERT-II reactor operations, and 2) Stratum 2—the are of the pond that did not receive discharge. These two strata are shown in a plan view of the PBF-16 pond in Figure 3-1. The depressional area that dominates Stratum 1 is also visible in Figure 1-1.

Next, the null hypothesis, H_0, was developed, and is stated as follows: The average mercury concentration inside the boundary of the PBF-16 leach pond is at or above the 0.5 mg/kg remedial action goal. The alternate hypothesis, H_a, for this study is: The average mercury concentration inside the boundary of the PBF-16 leach pond is below the 0.5 mg/kg remedial action goal. Another way of expressing the hypotheses are:

$$H_0 : \mu \geq 0.5 mg/kg$$

$$H_a : \mu < 0.5 mg/kg$$

where μ is the average mercury concentration in the PBF-16 leach pond soils. The second step was to apply nonparametric statistics to each of the PBF-16 leach pond strata to determine the number of samples required. Based on the fact that there was limited mercury data available for the PBF-16 leach pond, nonparametric statistics were selected for this study. Visual Sample Plan (VSP), software version 0.9e (Davidson et al. 1999), was used to calculate the number of samples for each strata, as well as determine the sample locations. The input parameters required for the VSP software to calculate the number of samples included the following:

σ_{est} = Estimated standard deviation

α = Type I decision error limit

β = Type II decision error limit

LBGR = Lower-bound of the gray region.

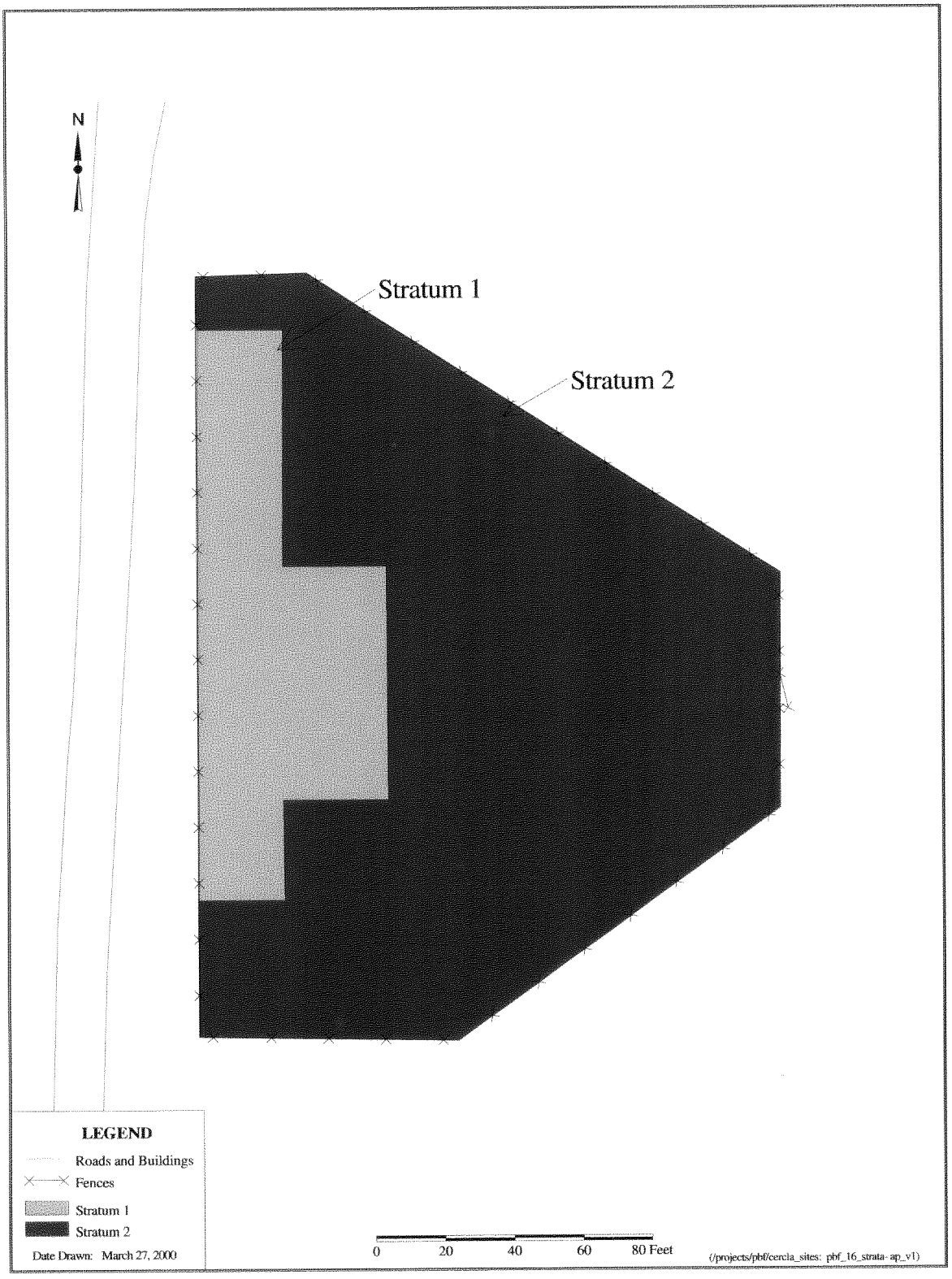

Figure 3-1. Plan view of the PBF-16 leach pond and the two identified strata.

The estimated standard deviation, σ_{est}, for the PBF-16 pond area was calculated using the following equation, modified from Deming (Deming 1984):

$$\sigma_{est} = \frac{range}{3},$$

where the range is defined as an acceptable range for the mercury contamination. The range of background concentrations for mercury for the INEEL was taken as 0 to 0.79 mg/kg (Martin et al. 1992), giving:

$$\sigma_{est} = 0.26\ mg/kg.$$

The LBGR defines the width of the gray area. The upper bound of the gray region is taken as the action level, or the remedial action goal, of 0.5 mg/kg. A first approximation to the LBGR is half the value of the decision level, in this case, *LBGR=0.25 mg/kg*.

The Type I and Type II decision error limits for this field sampling event are α=0.05 (Type I), and β=0.10 (Type II), giving a 5% probability at the action level of 0.5 mg/kg that the site will be declared clean, when the site is actually dirty, and a 10% probability at the LBGR that the site will be declared dirty when it is actually clean.

A random start, systematic sampling design using a mean vs. action level scenario, generated thirteen sample locations on a triangular sample grid in each of the two strata in the PBF-16 leach pond. Additionally, two biased sample points were identified in Stratum 1; one at the pipe inlet, and one at the low point in the pond. A statistical test (Wilcoxon Rank Sum Test) will be performed, if necessary, on the two data sets to determine which hypothesis, either H_0 or H_a, will be accepted. Additionally, the mean of each stratum and the leach pond as a whole will be evaluated to aid in the decision to proceed with remedial activities in the pond area.

3.2 Sampling Locations and Frequency

Figure 3-2 shows the two strata and the sampling locations within the strata. Systematic grid sample points in Stratum 1 are identified as "S1-1" through "S1-13," and the biased locations are identified as "B-1" and "B-2." Similarly, systematic grid sample points in Stratum 2 are identified as "S2-1" through "S2-13." The surface soil at each sample location was screened for mercury hot spots (>30 mg/kg) using a handheld field portable x-ray fluorescence spectrometer.

Composite surface soil samples for mercury were collected at all locations from 0 to 0.5 ft. Additionally, subsurface soil samples for mercury were collected at all locations within Stratum 1 at a depth interval of 0.5 to 1.5 ft. Further, subsurface composite samples were collected at the two biased locations, B-1 and B-2, at a depth interval from 5 to 7 ft., and subsurface samples will also be collected at the soil/basalt interface, which is estimated at 10 ft. A total of 52 soil samples were planned for collection during this field sampling event (INEEL 2000).

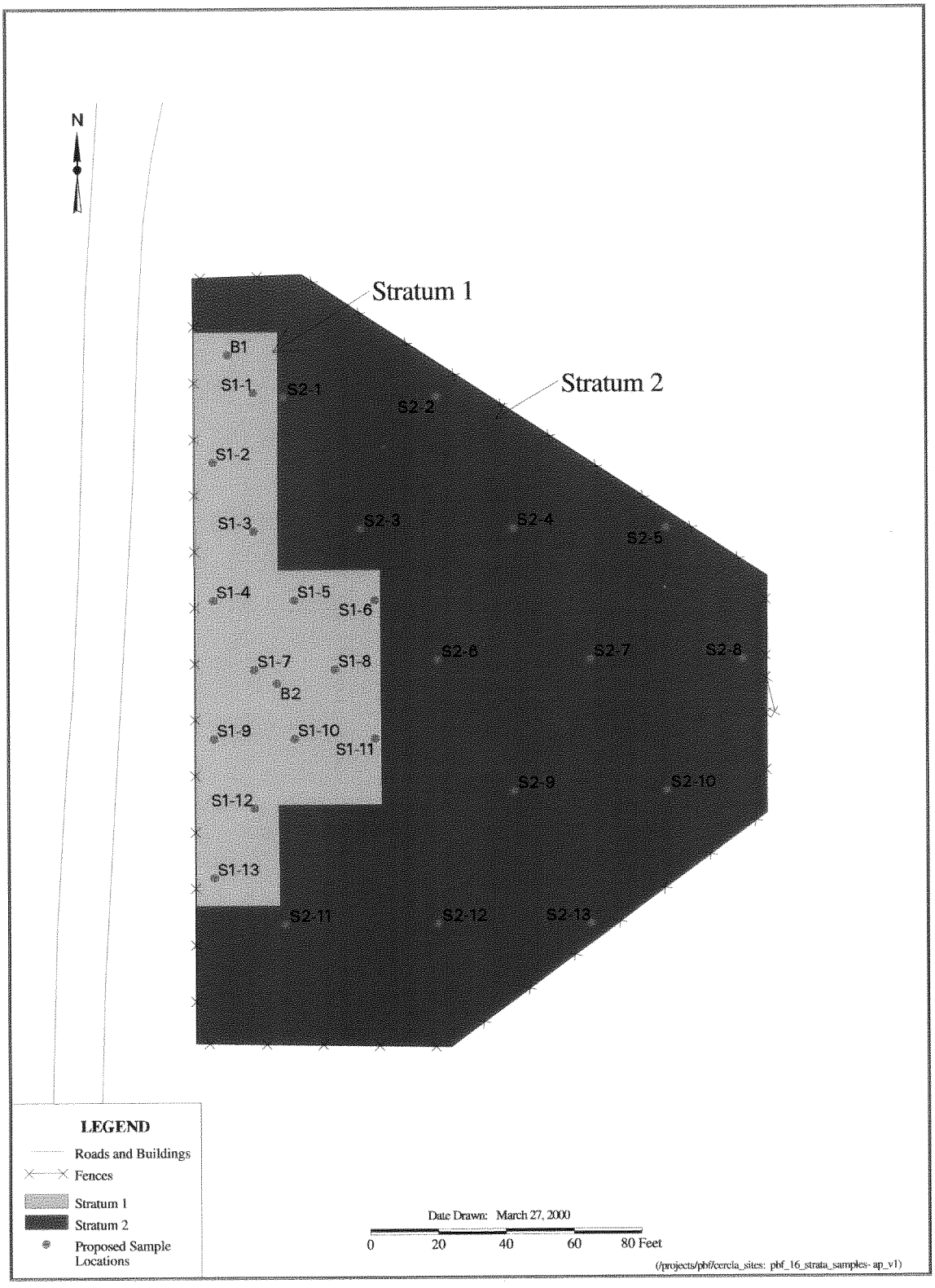

Figure 3-2. Post-ROD sample locations at PBF-16 leach pond.

3.3 Sampling Methods and Equipment

The surface soil samples were collected following the procedures outlined in the current revision of SOP 11.12, "Soil Sampling" (INEEL 1996b). All surface samples were spatial composites of five subsamples collected from 3.3 by 3.3 ft. plots. The samples were collected between 0 to 0.5 ft. in depth using a decontaminated spoon. A composite of five surface samples were collected at the four corners and the center of the plot. Following the collection of all subsamples, the soil was thoroughly mixed with the stainless steel spoon. Sample containers were then filled from this composite. Sample material left over was returned to the sample point from which it originated. All of the planned surface samples were collected.

Subsurface soil samples were collected from Stratum 1 in the PBF-16 area to evaluate the vertical extent of mercury contamination at the site. Subsurface sample points were designated S1-1 through S1-13, and B1 and B2. Subsurface composite samples were collected using a hand auger, following the procedures outlined in the current revision of SOP 11.12, "Soil Sampling" (INEEL 1996a). Subsurface samples were collected at a depth interval from 0.5 to 1.5 ft. at sample points designated S1-1 through S1-13, and B1 and B2. Additional subsurface samples were collected at sample point B2 at a depth intervals from 5 to 7 ft., and 9 to 10 ft. The core material from each sample interval was placed in a disposable aluminum pan and mixed thoroughly. A sample aliquot was taken and placed in the appropriately labeled sample container. All subsurface samples were collected with the exception of three samples at location B1; the subsurface sample from 5 to 7 ft. and the sample at the basalt interface, and associated duplicate sample at the basalt interface, were not collected due to complications in the field. Six attempts were made at different locations around point B1 to collect the samples from 5 to 7 ft. and at the basalt interface. Additionally, the sample from 1.5 to 2.5 ft. at location B1 was collected at an alternate location, designated B1-A. Details of the field sampling efforts at this location can be found in the sample/shipping logbook ER-59-00.

Decontamination of sampling equipment was performed as per SOP 11.5, *Field Decontamination of Sampling Equipment* (INEEL 1996b); with the exception that isopropanol was not used given that organic constituents are not a concern at the PBF-16 CERCLA site.

3.4 Quality Assurance/Quality Control Samples

Duplicate samples were collected for mercury analysis to assess the precision of the sampling event. Following the guidance provided in the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Inactive Sites* (DOE-ID 1997a), three duplicate soil samples were identified for collection: 1) surface sample location S1-3, 0 to 0.5 ft., 2) subsurface sample location S1-6, 0.5 to 1.5 ft., and 3) biased sample location B1 at the soil/basalt interface. However, as noted above, the duplicate at the soil/basalt interface was not collected. Three rinsate samples were also collected in the field after decontamination of sampling equipment, and analyzed for mercury.

3.5 Sample Analyses

Sample analyses were performed under contract with Southwest Research Institute in San Antonio, Texas. Total mercury content of the samples was determined by U.S. Environmental Protection Agency Document No. SW-846 methods; specifically, Method 7470A (aqueous) and Method 7471A (solid) by cold vapor atomic absorption spectrometry (CV-AAS). Total metals were determined by SW-846 methods including Method 7000A for metals analyzed by either direct aspiration flame atomic absorption spectrometry (DA-FAAS) or graphite furnace atomic absorption spectrometry (GF-AAS), Method 7062 for Sb and As if analyzed by hydride generation.flame atomic absorption spectrometry (HG-FAAS),

Method 7742 for Se if analyzed by HG-FAAS, and Method 6010B for metals analyzed by inductively coupled plasma atomic emission spectrometry (ICP-AES). TCLP analyses were performed on the extract using the following methods: Method 7470A for Hg by CV-AAS, Method 7000A for metals analyzed by either DA-FAAS or GF-AAS, Method 7062 for As if analyzed by HG-FAAS, Method 7742 for Se if analyzed by HG-FAAS, and Method 6010B for metals analyzed by ICP-AES.

4. RESULTS AND DISCUSSION

Field screening and laboratory analytical methods were employed during this sampling effort to evaluate the concentrations of mercury in surface and subsurface soils in the PBF-16 SPERT-II leach pond. The following sections detail the results of the field screening measurements and laboratory analyses.

4.1 XRF Field Screening Results

The hand-held NITON multi-element XRF analyzer was used at each of the 28 sample locations in the PBF-16 leach pond area. As anticipated, the NITON analyzer did not detect mercury at any of the sample locations. Table 4-1 summarizes the results of the XRF field screening measurements.

As shown in Table 4-1 above, field screening measurements did not show any mercury above the detection limits of the NITON XRF instrument; however, three locations showed positive results for lead. These results are also summarized in Figure 4-1. The field screening results did show the potential for elevated lead in the pond area, as previously noted in the *Preliminary Scoping Track 2 Summary Report for Operable Unit 5-08 and 5-09* (Hillman-Mason et al. 1994.)

Table 4-1. XRF field screening results.

Sample Point	Analyte	Concentration[a] (ppm, or mg/kg)	Measurement Date
B1	Mercury	<26.70	June 13, 2000
B2	Mercury	<17.25	June 13, 2000
	Lead	77.10 ± 26.70	
S1-1	Mercury	<14.55	June 13, 2000
S1-2	Mercury	<16.65	June 13, 2000
S1-3	Mercury	<15.75	June 13, 2000
S1-4	Mercury	<18.15	June 13, 2000
S1-5	Mercury	<19.65	June 13, 2000
	Lead	54.80 ± 29.10	
S1-6	Mercury	<14.25	June 13, 2000
S1-7	Mercury	<14.20	June 13, 2000
	Lead	140.10 ± 24.9	
S1-8	Mercury	<15.60	June 13, 2000
S1-9	Mercury	<14.40	June 13, 2000
S1-10	Mercury	<14.55	June 13, 2000
S1-11	Mercury	<14.55	June 13, 2000
S1-12	Mercury	<18.90	June 13, 2000
S1-13	Mercury	<15.15	June 13, 2000
S2-1	Mercury	<14.25	June 13, 2000
S2-2	Mercury	<27.30	June 13, 2000
S2-3	Mercury	<14.10	June 13, 2000
S2-4	Mercury	<21.00	June 13, 2000
S2-5	Mercury	<17.40	June 13, 2000
S2-6	Mercury	<14.85	June 13, 2000
S2-7	Mercury	<13.05	June 13, 2000
S2-8	Mercury	<22.50	June 13, 2000
S2-9	Mercury	<14.55	June 13, 2000
S2-10	Mercury	<15.45	June 13, 2000
S2-11	Mercury	<12.75	June 13, 2000
S2-12	Mercury	<13.50	June 13, 2000
S2-13	Mercury	<14.25	June 13, 2000

a. Concentrations listed as "< value" are less than the method detection limit listed. All values for mercury are less than the method detection limit. Only locations that showed a positive detect for lead are listed here with the mercury data.

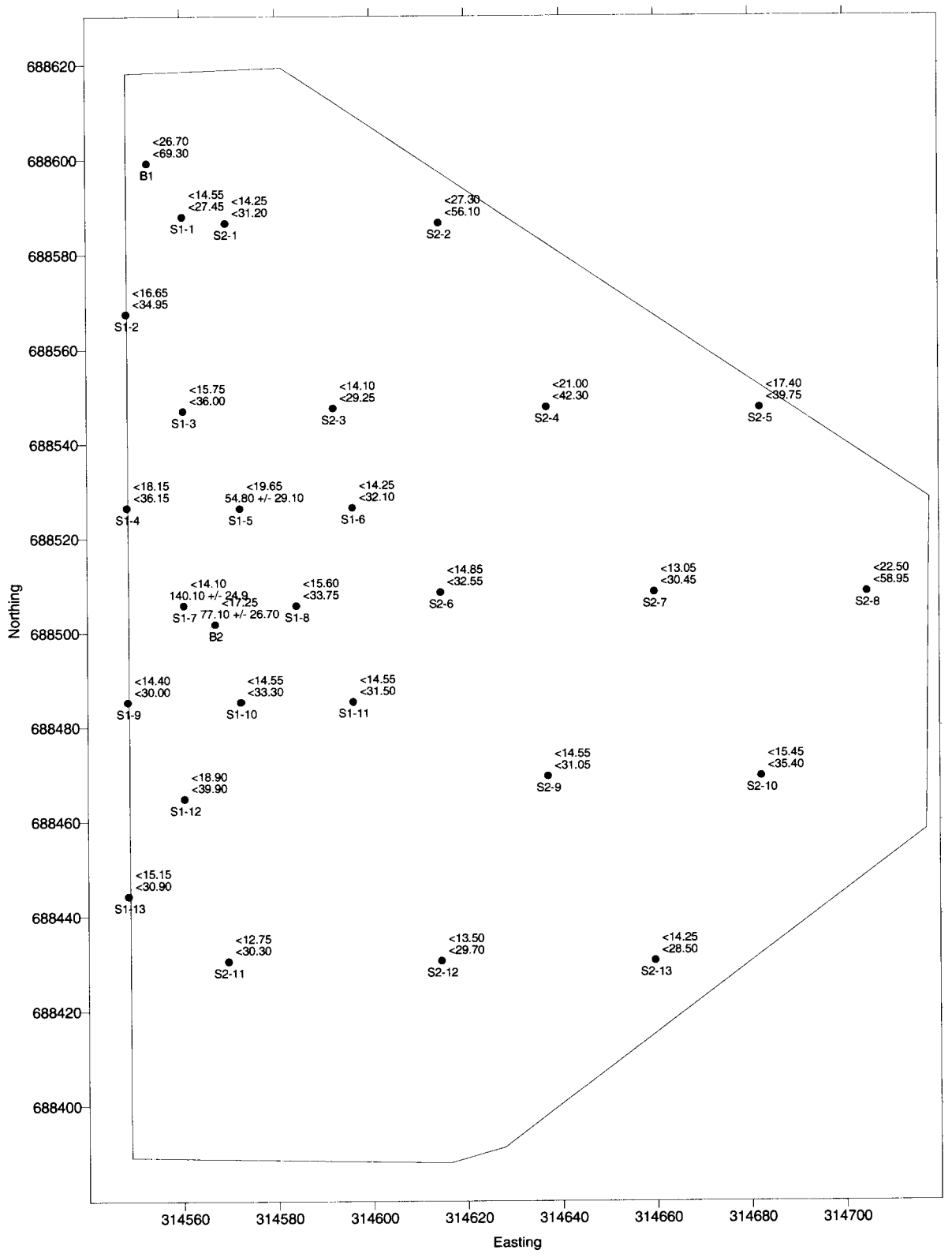

Figure 4-1. Field screening XRF results map.

4.2 Laboratory Analytical Results

Initial laboratory analyses for this field sampling effort included total mercury for all samples. The analytical results for the mercury analyses are listed in Attachment 1. The results of the surface (0 to 0.5 ft.) and subsurface (0.5 to 1.5 ft.) sampling and analysis for mercury are shown in Figures 4-2 and 4-3, respectively.

As can be seen from Attachment 1 and Figures 4-2 and 4-3, three samples contained mercury at levels above the instrument detection limits. The maximum concentration was 0.23 mg/kg at sample location B1 from a depth of 0.5 to 1.5 ft. The minimum concentration was 0.11 mg/kg at sample location B2 from 0 to 0.5 ft. Mercury was also detected at location S1-7 from 0 to 0.5 ft. at a concentration of 0.12 mg/kg. None of the sample results exceeded the 0.5 mg/kg remedial action goal for mercury.

Based on the field screening and laboratory mercury results, a decision was made to request additional analyses on select samples to verify that other metal concentrations were below risk based concentrations, and to verify that TCLP limits are not exceeded. This decision was based on the positive detection of lead with the field screening instrument at locations S1-5, S1-7 and B2, and the positive detection of mercury in the analytical samples from locations S1-7, B1, and B2. As indicated in Section 3.5, the additional analyses requested were contract laboratory program (CLP) metals (totals) and TCLP metals. These additional analyses were performed on four surface (0 to 0.5 ft.) and four subsurface (0.5 to 1.5 ft.) samples from locations S1-5, S1-7, B1 and B2. The CLP and TCLP analytical results are listed in Attachment 2. The CLP results show that all concentrations are consistent with INEEL background values (Rood et al. 1996). Additionally, the TCLP analyses show that the leachable quantities of metals in the soils are well below the regulatory levels defined in 40 CFR 261.24.

Figure 4-2. Surface (0 to 0.5 ft.) mercury sample results.

Figure 4-3. Subsurface (0.5 to 1.5 ft.) mercury sample results.

5. SUMMARY AND RECOMMENDATIONS

The post-ROD sampling at the PBF-16 CERCLA site was designed to determine the aerial and vertical extent of the mercury contamination in excess of the 0.5 mg/kg remedial action goal. A combination of field screening and laboratory measurements were used to achieve this goal. Based on field screening and total mercury results, additional analyses were performed on select samples to evaluate concentrations of other metals, and verify that the soils are not RCRA characteristic for metals. The field screening and analytical results are summarized as follows:

- Field screening measurements with the XRF instrument did not detect any mercury contamination above the instrument detection limits
- 26 of 28 surface samples were non-detect; the other two samples, S1-7 and B2, contained mercury at 0.12 and 0.11 mg/kg, respectively
- 18 of 22 subsurface samples were non-detect; one positive detection at location B1 from 0.5 to 1.5 ft. at a concentration of 0.23 mg/kg; three of the planned subsurface samples not collected at location B1
- All positive results for total mercury below the 0.5 mg/kg remedial action goal
- CLP metals data are consistent with INEEL background values (Rood et al. 1996)
- TCLP metals data are significantly below regulatory limits defined in 40 CFR 261.24.

Based on the field screening and analytical results obtained from the PBF-16 post-ROD sampling, it is recommended that no further remedial actions be taken at the PBF-16 leach pond.

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Attachment 1

Analytical Results for Mercury at PBF-16

Attachment 1—Analytical Results for Mercury at PBF-16.

Sample Point	Sample ID	Sample Depth (ft)	Analyte	Concentration (mg/kg)	Sample Date
B1	PBF04601HG	0-0.5	Mercury	<0.09	06/13/2000
B1	PBF04701HG	0.5-1.5	Mercury	0.23	06/13/2000
B1-A	PBF04801HG	1.5-2.5	Mercury	<0.09	06/13/2000
B1	PBF04901HG	5-7	Mercury	Not Collected	06/13/2000
B1	PBF05001HG	TBD	Mercury	Not Collected	06/13/2000
B1 (Duplicate)	PBF05002HG	TBD	Mercury	Not Collected	06/13/2000
B2	PBF05101HG	0-0.5	Mercury	0.11	06/13/2000
B2	PBF05201HG	0.5-1.5	Mercury	<0.09	06/13/2000
B2	PBF05301HG	1.5-2.5	Mercury	<0.09	06/13/2000
B2	PBF05401HG	5-7	Mercury	<0.09	06/13/2000
B2	PBF05501HG	9-10	Mercury	<0.09	06/13/2000
S1-1	PBF02001HG	0-0.5	Mercury	<0.08	06/13/2000
S1-1	PBF02101HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-2	PBF02201HG	0-0.5	Mercury	<0.08	06/13/2000
S1-2	PBF02301HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-3	PBF02401HG	0-0.5	Mercury	<0.08	06/13/2000
S1-3 (Duplicate)	PBF02402HG	0-0.5	Mercury	<0.09	06/13/2000
S1-3	PBF02501HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-4	PBF02601HG	0-0.5	Mercury	<0.09	06/13/2000
S1-4	PBF02701HG	0.5-1.5	Mercury	<0.10	06/13/2000
S1-5	PBF02801HG	0-0.5	Mercury	<0.09	06/13/2000
S1-5	PBF02901HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-6	PBF03001HG	0-0.5	Mercury	<0.08	06/13/2000
S1-6	PBF03101HG	0.5-1.5	Mercury	<0.08	06/13/2000
S1-6 (Duplicate)	PBF03102HG	0.5-1.5	Mercury	<0.08	06/13/2000
S1-7	PBF03201HG	0-0.5	Mercury	0.12	06/13/2000
S1-7	PBF03301HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-8	PBF03401HG	0-0.5	Mercury	<0.09	06/13/2000
S1-8	PBF03501HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-9	PBF03601HG	0-0.5	Mercury	<0.08	06/13/2000
S1-9	PBF03701HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-10	PBF03801HG	0-0.5	Mercury	<0.09	06/13/2000
S1-10	PBF03901HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-11	PBF04001HG	0-0.5	Mercury	<0.08	06/13/2000
S1-11	PBF04101HG	0.5-1.5	Mercury	<0.09	06/13/2000
S1-12	PBF04201HG	0-0.5	Mercury	<0.09	06/13/2000
S1-12	PBF04301HG	0.5-1.5	Mercury	<0.10	06/13/2000
S1-13	PBF04401HG	0-0.5	Mercury	<0.09	06/13/2000

Sample Point	Sample ID	Sample Depth (ft)	Analyte	Concentration (mg/kg)	Sample Date
S1-13	PBF04501HG	0.5-1.5	Mercury	<0.09	06/13/2000
S2-1	PBF05601HG	0-0.5	Mercury	<0.09	06/13/2000
S2-2	PBF05701HG	0-0.5	Mercury	<0.10	06/13/2000
S2-3	PBF05801HG	0-0.5	Mercury	<0.10	06/13/2000
S2-4	PBF05901HG	0-0.5	Mercury	<0.09	06/13/2000
S2-5	PBF06001HG	0-0.5	Mercury	<0.08	06/13/2000
S2-6	PBF06101HG	0-0.5	Mercury	<0.08	06/13/2000
S2-7	PBF06201HG	0-0.5	Mercury	<0.10	06/13/2000
S2-8	PBF06301HG	0-0.5	Mercury	<0.08	06/13/2000
S2-9	PBF06401HG	0-0.5	Mercury	<0.10	06/13/2000
S2-10	PBF06501HG	0-0.5	Mercury	<0.09	06/13/2000
S2-11	PBF06601HG	0-0.5	Mercury	<0.09	06/13/2000
S2-12	PBF06701HG	0-0.5	Mercury	<0.09	06/13/2000
S2-13	PBF06801HG	0-0.5	Mercury	<0.10	06/13/2000
QC (Rinsate)	PBF06901HG	N/A	Mercury	<0.20	06/13/2000
QC (Rinsate)	PBF07001HG	N/A	Mercury	<0.20	06/13/2000
QC (Rinsate)	PBF07101HG	N/A	Mercury	<0.20	06/13/2000

Attachment 2

Analytical Results for TCLP and Total Metals at PBF-16

Attachment 2—Analytical Results for TCLP and Total Metals at PBF-16.

SAMPLE NUMBER: SAMPLE LOCATION: SAMPLE DEPTH (ft.): ANALYSIS-	PBF02801HG S1-5 0 – 0.5	PBF03201HG S1-7 0 – 0.5	PBF04601HG B1 0 – 0.5	PBF05101HG B2 0 – 0.5
Metals (mg/kg)				
Aluminum	9090	8680	8640	9600
Antimony	<0.94	<0.95	<0.93	<0.94
Arsenic	6.6	4.6	6.7	4.9
Barium	125	112	151	128
Beryllium	0.65	0.55	0.56	0.62
Cadmium	2.6	2.0	0.47	1.5
Calcium	5940	12000	14400	14000
Chromium	51.6	79.7	24.2	55.4
Cobalt	6.2	5.9	6.1	6.2
Copper	18.6	30.5	17.7	24.0
Iron	16900	16100	16600	16600
Lead	16.3	31.3	12.2	23.4
Magnesium	4720	5150	5800	5490
Manganese	156	131	262	170
Nickel	18.5	20.0	19.3	18.9
Potassium	2600	2430	2340	2600
Selenium	0.48	0.58	0.52	0.60
Silver	<0.47	<0.48	<0.47	<0.47
Sodium	69.6	99.4	115	112
Thallium	<0.94	<0.95	<0.93	<0.94
Vanadium	29.8	31.2	30.2	31.0
Zinc	113	269	72.4	195
TCLP Metals (µg/L)				
Arsenic	5.9	<5.0	<5.0	<5.0
Barium	614	875	1050	1020
Cadmium	21.6	18.4	<5.0	11.2
Chromium	14.8	14.7	<5.0	10.2
Lead	<5.0	6.2	<5.0	<5.0
Mercury	<0.20	<0.20	<0.20	<0.20
Selenium	7.2	5.9	6.0	5.0
Silver	<5.0	<5.0	<5.0	<5.0

Attachment 2—Analytical Results for TCLP and Total Metals at PBF-16.

SAMPLE NUMBER: SAMPLE LOCATION: SAMPLE DEPTH (ft.): ANALYSIS-	PBF02901HG S1-5 0.5 – 1.5	PBF03301HG S1-7 0.5 – 1.5	PBF04701HG B1 0.5 – 1.5	PBF05201HG B2 0.5 – 1.5
Metals (mg/kg)				
Aluminum	10200	10800	8360	11100
Antimony	<0.94	<0.96	<0.92	<0.94
Arsenic	7.0	6.3	7.0	6.5
Barium	138	110	116	144
Beryllium	0.68	0.68	0.53	0.68
Cadmium	<0.47	<0.48	0.66	<0.47
Calcium	8720	9040	10400	19300
Chromium	25.0	26.0	65.9	25.0
Cobalt	7.3	8.5	6.2	6.9
Copper	19.8	18.1	32.2	19.4
Iron	17700	18900	18100	17800
Lead	12.8	12.9	28.5	12.5
Magnesium	5410	6350	5200	6070
Manganese	270	298	174	255
Nickel	22.6	22.7	31.9	21.8
Potassium	2060	2070	1800	2230
Selenium	<0.47	<0.48	<0.46	<0.47
Silver	<0.47	<0.48	<0.46	<0.47
Sodium	98.3	134	129	1280
Thallium	<0.94	<0.96	<0.92	<0.94
Vanadium	32.1	29.8	33.8	32.1
Zinc	63.1	66.9	149	71.4
TCLP Metals (µg/L)				
Arsenic	<5.0	<5.0	7.3	<5.0
Barium	646	665	8.14	1180
Cadmium	<5.0	<5.0	5.7	<5.0
Chromium	<5.0	<5.0	<5.0	<5.0
Lead	<5.0	<5.0	<5.0	<5.0
Mercury	<0.20	<0.20	<0.20	<0.20
Selenium	6.0	<5.0	5.2	5.5
Silver	<5.0	<5.0	<5.0	<5.0